

Stability Analysis and Controller Design of Further Development of Miniaturized Mössbauer Spectrometer II for Space Applications with Focus on the Extended Lyapunov Method - Part I -

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Abstract : In the context of planetary exploration, the MIMOS II (miniaturized Mössbauer spectrometer) serves as a proven and reliable measuring instrument. The transmission behaviour of the electronics in the Mössbauer spectroscopy is newly developed and optimized. For this purpose, the overall electronics is split into three parts. This elaboration deals exclusively with the first part of the signal chain for the evaluation of photons in experiments with gamma radiation. Parallel to the analysis of the electronics, a new method for the stability consideration of linear and non-linear systems is presented: The extended method of Lyapunov's stability criteria. The design helps to weigh advantages and disadvantages against other simulated circuits in order to optimize the MIMOS II for the terrestrial and extraterrestrial measurement. Finally, after stability analysis, the controller design according to Ackermann is performed, achieving the best possible optimization of the output variable through a skillful pole assignment.

Keywords : Mössbauer spectroscopy, electronic signal amplifier, light processing technology, photocurrent, trans-impedance amplifier, extended Lyapunov method

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